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For and on behalf of RWS Group Ltd

The 30th day of April 2008

# FEDERAL REPUBLIC OF GERMANY



## Priority Certificate DE 102 52 285.5 for the filing of a Patent Application

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**Title:** Hinge for connecting a hood, especially an engine hood, to a vehicle body

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Niggebaum

TAKATA-PETRI AG  
Bahnweg 1  
63743 Aschaffenburg  
PTR 440

**Hinge for connecting a hood, especially an engine hood,  
to a vehicle body**

**Description**

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The invention relates to a hinge for connecting a hood, especially an engine hood, to a vehicle body in accordance with the precharacterizing clause of claim 1, and to an airbag for opening a hood connected by a hinge to a vehicle body in accordance with the precharacterizing clause of claim 18.

Different measures have been proposed in order to protect pedestrians in the event of accidents with motor vehicles. There are various approaches to reducing the loads to which a pedestrian's head is subjected when he impacts against a motor vehicle. Currently known, active systems are focused on raising the engine hood in the region of the cowl. This makes it possible, by deformation of the engine hood, for energy from the pedestrian involved in the accident to be dissipated without him coming into contact with rigid parts situated under the engine hood. However, the engine hood is conventionally connected to the vehicle body in the region of the cowl via a hinge.

It is therefore the object of the present invention to specify a hinge which makes improved protection for pedestrians possible.

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The object is achieved by a hinge having the features of claim 1 and having the features of claim 2.

Accordingly, the hinge for connecting a hood, especially an engine hood, to a vehicle body is designed in such a manner that the hood is released

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from the hinge in the event of an accident, especially with a pedestrian.

5 The object is furthermore achieved by a hinge for connecting a hood, having at least one hinge carrier arranged on the vehicle body, at least one hinge arm arranged on the hood and at least one connecting part for the pivotable connection of the hinge arm to the hinge carrier, the connection of the hinge arm to the  
10 hinge carrier being released in the event of an accident by the connecting part.

In this case, the engine hood hinge can be released by complete separation of the engine hood and vehicle  
15 body, with, in this case, a device which limits the movement of the engine hood additionally having to be provided. On the other hand, the release of the engine hood hinge can be brought about by only parts of the hinge connection being released, so that there is not a  
20 complete separation between the engine hood and vehicle body, with the desired freedom of movement during the raising of the engine hood nevertheless being provided. In this case, the movement of the engine hood can likewise be limited by the non-separated connection.

25 Claims 1 to 17 describe various options for releasing the hood, especially the engine hood, from the vehicle body. These principles include, among others, the use of an explosive screw (pyrotechnically), the use of  
30 shear pins and the use of an airbag for releasing the hinge. In the case of using shear pins with an airbag being used to raise the engine hood, it is expedient to introduce the airbag forces as close to the hinge as possible in order to enable an efficient and low-  
35 vibration shearing off of the shear pins. The expansion of the airbag can be used to exert tensile or shearing forces on a connecting element connecting the two hinge parts, in particular a bolt, this bolt then being

disengaged from at least one of the two other hinge parts by the forces exerted.

5 In the case of complete separation of the engine hood in the hinge region from the vehicle body, further measures have to be taken so that the engine hood, after release from the hinge, does not exhibit uncontrolled behavior and could possibly be a risk to a pedestrian. For example, rebound straps may be used  
10 here, in which case the expansion behavior of the rebound straps and additional rip seams placed in the rebound strap may contribute to the engine hood moving as gently as possible at a defined force level into its erected end position. This enables vibrations of the  
15 engine hood in association with the erection thereof to be reduced and the period of time for damping unavoidable vibrations to be reduced.

By means of a complete or partial release of the hinge  
20 connection, a movement of the engine hood about a rotation point on the vehicle front is possible. Inadvertent damage to the engine hood, the hinge and the adjacent vehicle regions can thus be minimized. In order to optimize the rotation point of the engine hood  
25 in the front vehicle region, it may be necessary to provide additional devices which render the engine hood pivotable in the event of an accident. In this case, the rotation point may be shifted, for example by means of a lever mechanism, in such a manner that the engine  
30 hood is freely pivotable in the desired region without striking against remaining vehicle regions.

The invention is explained in brief below with reference to the drawings of the figures.

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Figure 1 shows a general hinge construction, the hinge being composed of a hinge carrier 1, which is usually connected to the vehicle body, a hinge arm 2, which is

usually connected to the engine hood, and a connecting part in the form of a hinge bolt 3. The hinge arm 2 is pivotable in relation to the hinge carrier 1 about the axis of the hinge bolt 3.

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Figure 2 shows a hinge according to the invention in a state in which the separation of the engine hood and vehicle body from the hinge has already been completed. The hinge bolt 3 was replaced here by an explosive  
10 bolt, so that the connection between the hinge arm 2 and the hinge carrier 1 is separated by the explosive bolt blasting off. In the state shown in figure 2, an airbag 6 situated under the engine hood, which is connected to the hinge arm 2, has already lifted off  
15 the hinge arm from the hinge carrier. The movement of the hinge arm 2 in relation to the hinge carrier 1 is limited by a rebound strap 4 which is arranged between the hinge carrier and hinge arm. The rebound strap firstly has rip seams and is secondly of elastic  
20 design, so that, upon deployment of the airbag 6, the engine hood is transferred relatively gently into its end state and vibrations of the engine good are therefore avoided.

25 Figure 3 shows a further embodiment of the hinge according to the invention. In this case, the hinge arm 2 is connected to the hinge carrier 1 via a shear pin 3. In the event of the deployment of the airbag (not shown here), the shear pin 3 is sheared off by the  
30 forces exerted by the airbag, so that the connection between the hinge arm 2 and the hinge carrier 1 is eliminated. The engine hood can thus be transferred into its open position.

35 Figure 4 shows a further embodiment of the hinge according to the invention. In this case, the connecting part in the form of a bolt 3 is connected to an airbag bypass 4 via a transmission element 5. If the

airbag is ignited, then the elastic airbag bypass 4 expands and, via the transmission element 5, pulls the bolt 3 out of its original position. The hinge carrier 1 and connecting arm 2 are therefore released from each other.

Figure 5 shows an embodiment of the hinge according to the invention, in which the airbag 6 is longer in its original state than in its inflated state. The airbag 6 is connected to the bolt 3 of the hinge via a transmission element 5. If the airbag 6 is inflated, its original length is shortened and the bolt 3 is pulled out of its connection via the transmission element 5, as a result of which the hinge arm 2 and hinge carrier 1 are released from each other. The bolt 3 may be pretensioned here by a spring, in the same manner as in the embodiment shown in figure 4. When the airbag relaxes, the bolt will therefore snap back again into its original position.

Figure 6 shows a hinge according to the invention in the form of a ball and socket hinge. The connecting part 3 is designed here in the form of a ball which is fitted directly onto the hinge arm 2. The spherical connecting part 3 is accommodated in a two-part hinge carrier which comprises a fixed part 10 and a part 11 which can be pivoted about an axis 12. The spherical connecting part 3 is accommodated in this case in corresponding sockets on the hinge carrier parts 10 and 11. The hinge carrier parts 10, 11 are connected to each other via a clamp 13. If a force is exerted on the transmission element 5 by a deploying airbag 6, then the clamp 13, which is arranged on the transmission element 5, is released from the two hinge carrier parts 10, 11, so that the moveable hinge carrier part 11 folds about the axis 12 and releases the spherical connecting element 3.

Figure 7 shows a further embodiment. In this case, the hinge arm 2 has a deformation region 20 in which the hinge arm 2 can be deformed. If an airbag arranged under the engine hood is ignited, then the deformation region 20 of the hinge arm 2 is deformed, with the result that the connecting part 3 migrates out of a socket 100 on the hinge carrier 1 and thereby releases the connection. It migrates out owing to the shortening of the hinge arm 2 that is projected onto the socket 100. The opening movement is controlled by a lever 4 which moves in a coulisse 40 on the hinge carrier 1. As a result, a defined opening behavior can be achieved. A further possible coulisse guide, for example for the connecting part 3, is shown in the upper region of figure 7. In an initial position, the connecting part 3 is securely clamped in the region 41 of the coulisse guide behind a locking element 42. If an airbag is deployed, then the part 3 migrates on the path indicated by the arrow past a one-way flap 43 into the open position 45. After the accident, the hood can be brought by pressing down from the region 45 past the one-way flap 43 again into a transportation position 44 in which a journey to the next workplace is possible.

Figure 8 shows a further embodiment, in which the deployment of an airbag 6 acts again, via a transition element designed as a lever 6, on the bolt 3 in such a manner that, when the airbag 6 is deployed, the bolt is pulled back out of its connection. The airbag operates here in the form of a piston and is adjacent to piston-shaped caps 62.

Figure 9 shows a particular embodiment of a suitable airbag 6. In this case, the airbag is positioned in the vehicle in such a manner that it is situated in the direct vicinity of the hinges of the engine hood. A gas lance 60, the outlet openings of which are likewise arranged in the direct vicinity of the hinges, is

arranged in the airbag 6. If a gas for deploying the airbag 6 is generated by the gas generator 61, then, as shown under I., the airbag region which is situated in the region of the hinges is inflated first of all. Only  
5 then is the remaining airbag deployed. The effect achieved by this is that preliminary forces occur initially in the region of the hinges, said forces enabling the hinge to be released and only then is the rest of the engine hood raised. This prevents the  
10 engine hood from unnecessarily vibrating.

**Patent Claims**

1. A hinge for connecting a hood, especially an engine hood, to a vehicle body, characterized in that  
5 the hinge is designed in such a manner that it releases the hood in the event of an accident, especially with a pedestrian.
2. A hinge for connecting a hood, especially an  
10 engine hood, to a vehicle body, having at least one hinge carrier arranged on the vehicle body, at least one hinge arm arranged on the hood and at least one connecting part for the pivotable connection of the hinge arm to the hinge carrier, characterized in that  
15 the connection of the hinge arm to the hinge carrier is released in the event of an accident by removal and/or destruction of the connecting part.
3. The hinge as claimed in claim 2, characterized in  
20 that the connecting part is designed as an explosive bolt or shear bolt.
4. The hinge as claimed in claim 2 or 3,  
25 characterized in that the connecting part is guided in at least one socket on the hinge arm and in at least one socket on the hinge carrier and, in the event of an accident, is removed from at least one socket.
5. The hinge as claimed in claim 4, characterized in  
30 that the connecting part is designed as a bolt which is pulled out of at least one of the sockets.
6. The hinge as claimed in claim 4 or 5,  
35 characterized in that at least one actuating means is provided for actuating the connecting part in the event of an accident.
7. The hinge as claimed in claim 6, characterized in

that the actuating means comprises a pyrotechnic element.

8. The hinge as claimed in claim 6 or 7,  
5 characterized in that the actuating means is an inflatable airbag and/or a gas-conducting element.

9. The hinge as claimed in claim 8, characterized in  
10 that the airbag and/or the gas-conducting element acts on the connecting part via at least one transmission element.

10. The hinge as claimed in claim 9, characterized in  
15 that the transmission element is designed as a lever.

11. The hinge as claimed in one of claims 8 to 10,  
characterized in that, on filling with gas, the airbag  
and/or the gas-conducting element, owing to its  
expansion, exerts a push or a pull on the connecting  
20 part and/or the transmission element.

12. The hinge as claimed in one of the preceding  
claims, characterized in that the connecting part is of  
spherical design, and the hinge carrier has at least  
25 one socket which corresponds with the connecting part and is designed in such a manner that it releases the connecting part in the event of an accident.

13. The hinge as claimed in claim 12, characterized in  
30 that the hinge carrier has at least one moveable hinge carrier part which, in the event of an accident, is moved in relation to at least one fixed hinge carrier part in such a manner that the connecting part accommodated therein comes free.

14. The hinge as claimed in one of the preceding  
35 claims, characterized in that the hinge arm has a deformation region for the specific deformation of the

hinge arm in the event of an accident.

15. The hinge as claimed in claim 14, characterized in that the connecting part is disengaged from the hinge carrier by deformation of the hinge arm.

16. The hinge as claimed in one of the preceding claims, characterized in that at least one limiting means is arranged for limiting the relative movement between the hinge carrier and hinge arm.

17. The hinge as claimed in claim 16, characterized in that the limiting means is a rebound strap and/or a lever guided in a coulisse.

18. An airbag for opening a hood connected by a hinge to a vehicle body, especially an engine hood, characterized in that the airbag is designed in such a manner that it releases the hood from the vehicle body when deployed in the region of the hinge.

19. The airbag as claimed in claim 18, characterized in that airbag regions are arranged directly on the hinge.

20. The airbag as claimed in claim 19, characterized in that the airbag, when deployed, is first of all deployed in the regions arranged on the hinge.

21. The airbag as claimed in claim 19 or 20, characterized in that a gas-conducting system, in particular a gas lance, is arranged in the interior of the airbag, said lance conducting the gas used for the deployment into the airbag regions arranged on the hinge.

**TAK 440**

**Abstract**

The invention relates to a hinge for connecting a hood, especially an engine hood, to a vehicle body, in which the hinge is designed in such a manner that it releases the hood in the event of an accident, especially with a pedestrian.

**Fig. 1**

## General hinge construction

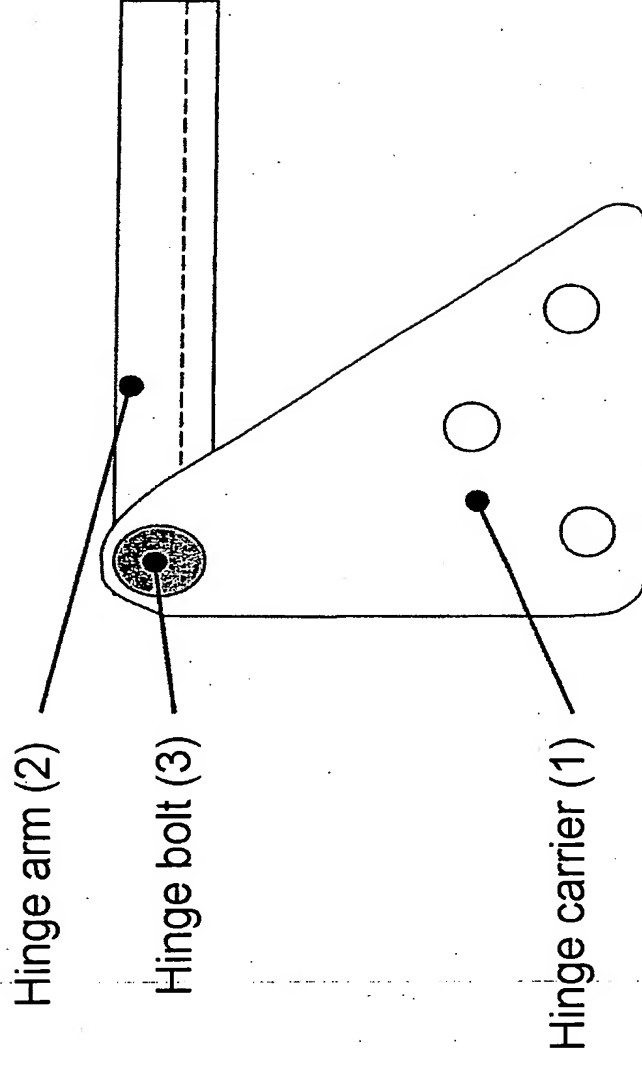
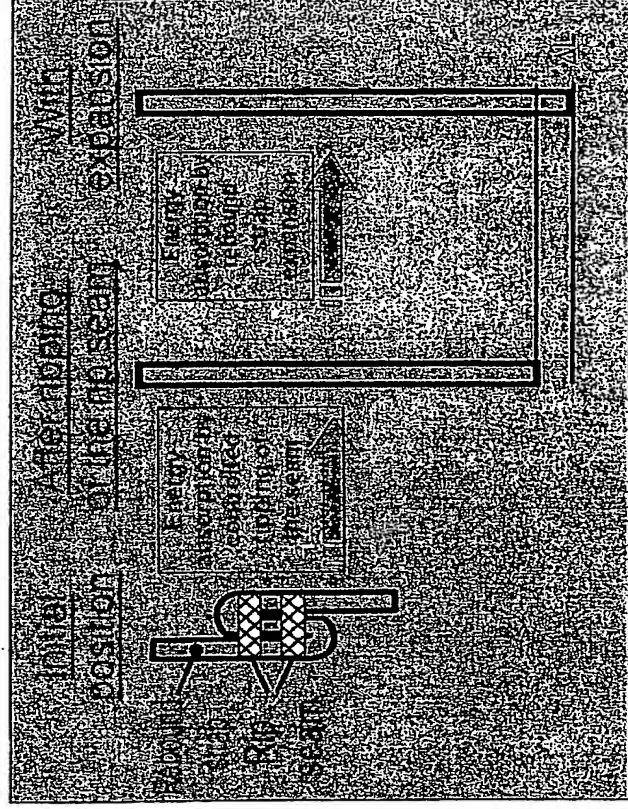
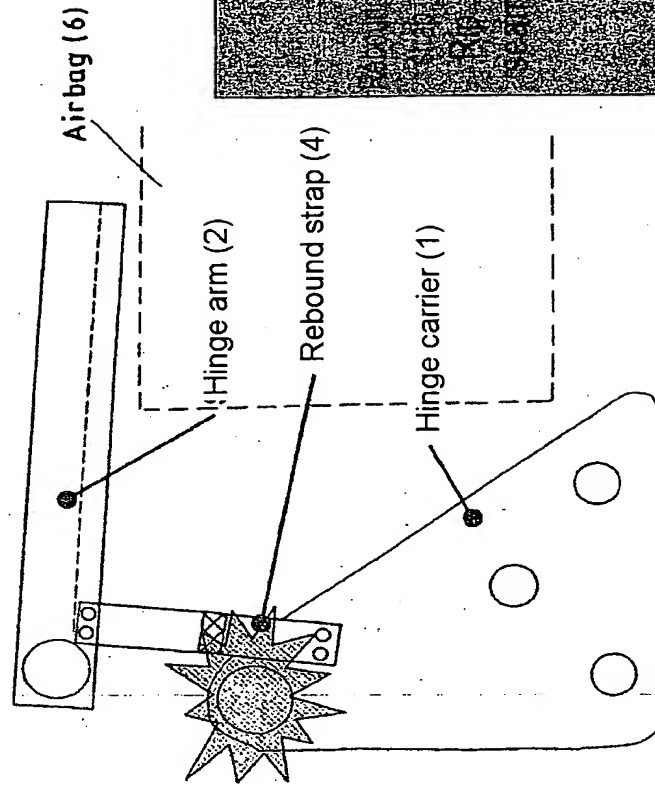


Fig. 2

# Released engine hood hinge

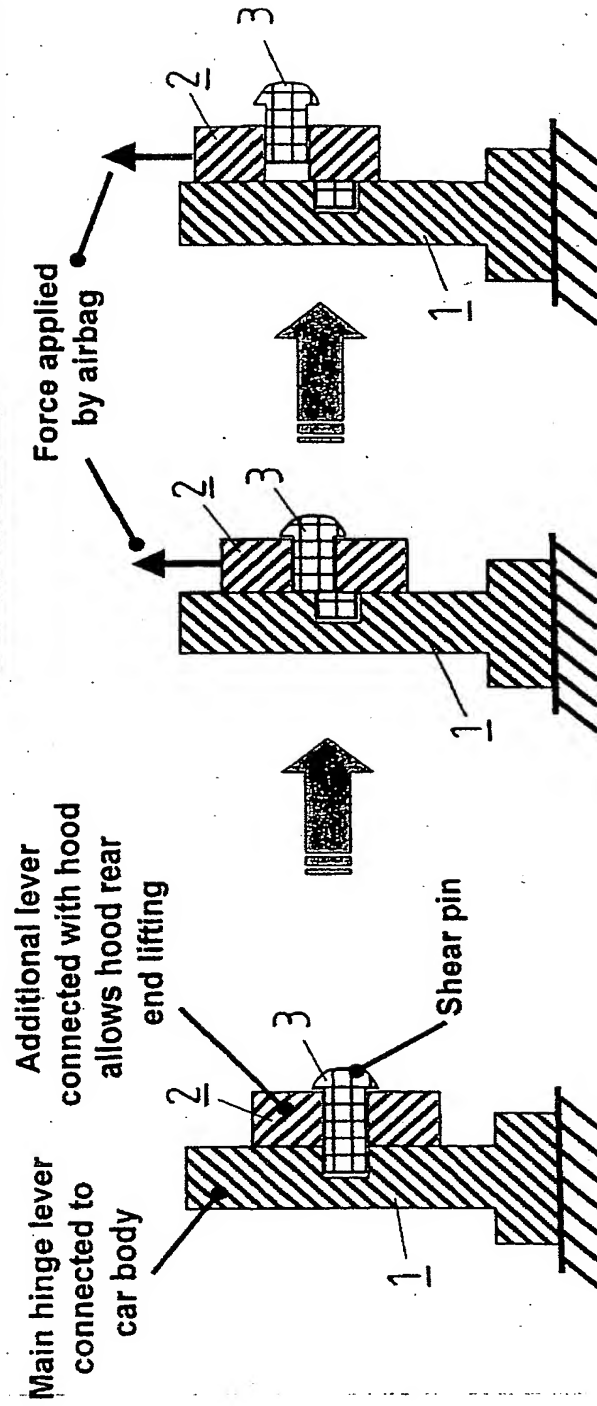


**Fig. 3**

**Hood release concepts - shear pin separating -**

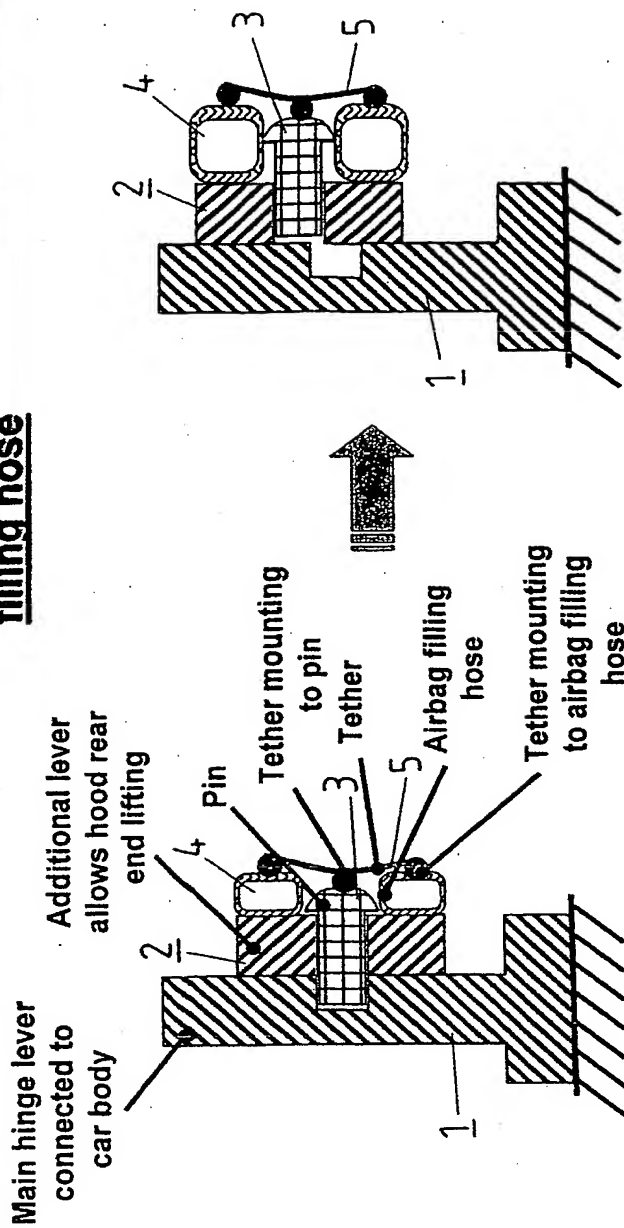
**Separating of main hinge lever and additional lever by shear off the shear pin**

**Initial positioning**



**Fig. 4**      **Hood release concepts - airbag bypass -**  
**Separating of main hinge lever**  
**and additional lever by deployed**  
**filling hose**

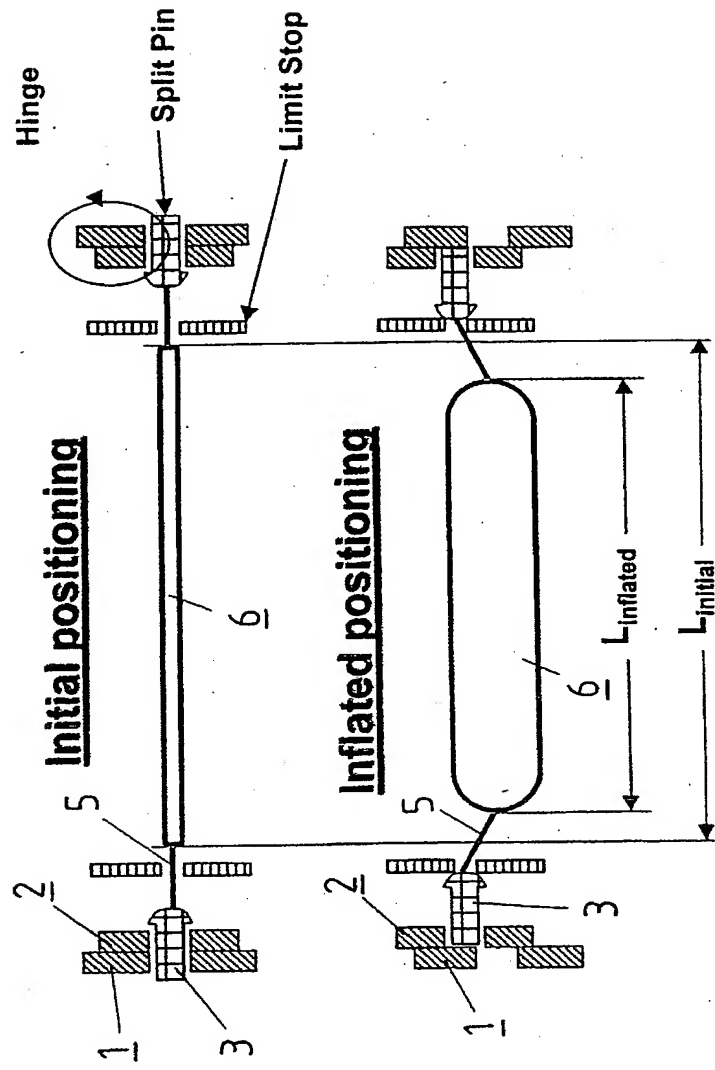
**Initial positioning**



Spring-loaded repositioning

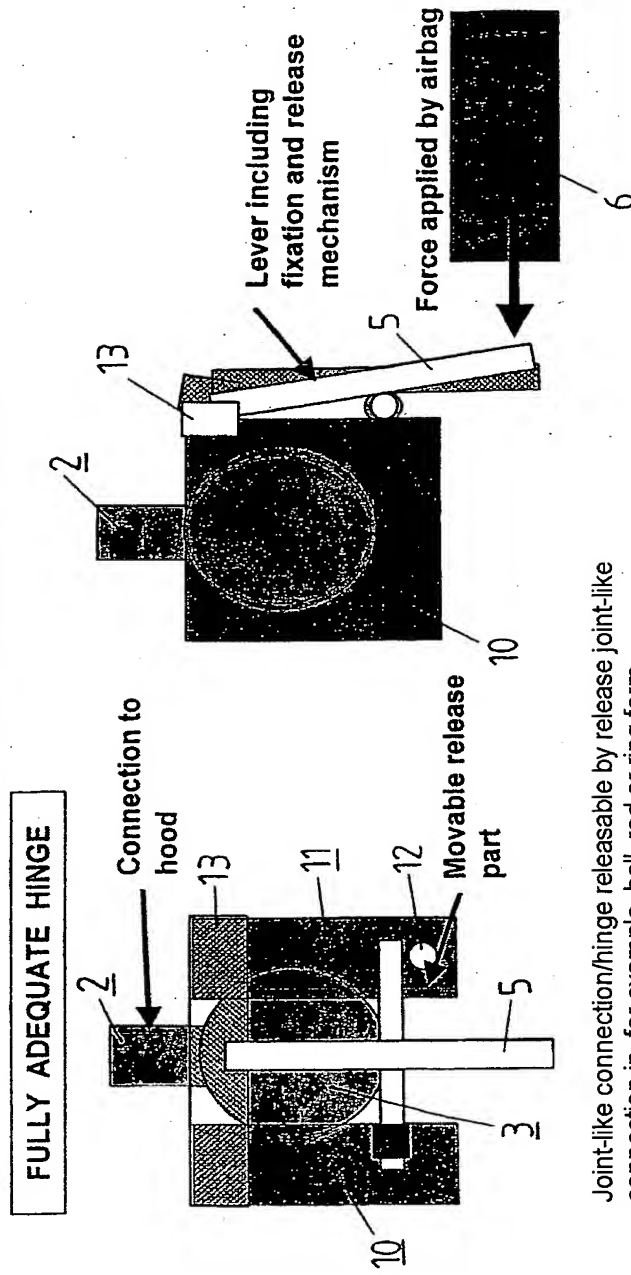
Fig. 5

Hood release concepts - airbag lengthwise contraction-



Spring-loaded repositioning

**Fig. 6** Ideas of hood releasing concepts  
- airbag initiated release-



Joint-like connection/hinge releasable by release joint-like connection in, for example, ball, rod or ring form

Ball and socket joint embodiment: for example, mounted in half shells which can be opened up, as a high-quality engine hood/hinge

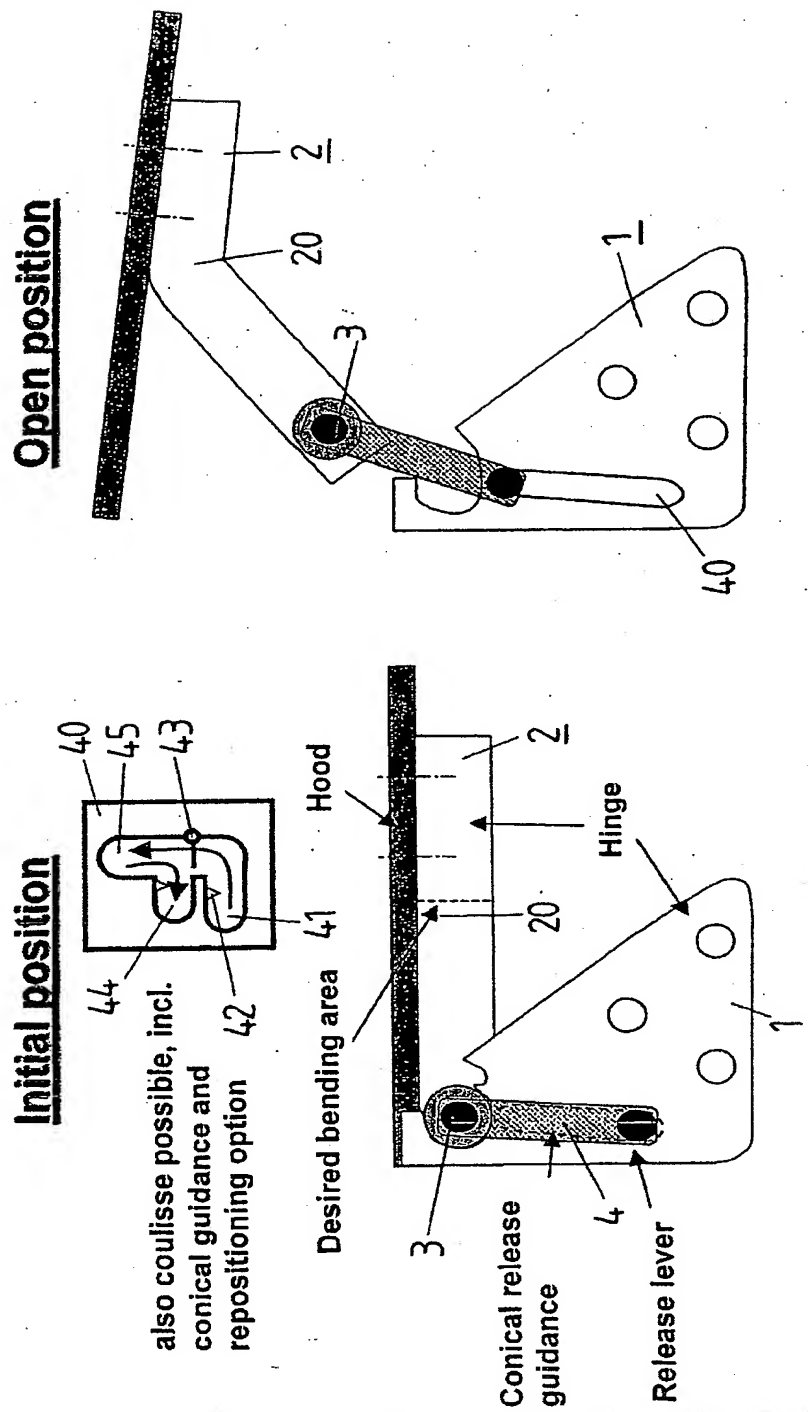
- at least one half shell movable
- half shell fixed via activatable mount
- mount activatable directly or indirectly via at least one part of the airbag system or separate device

**Spring-loaded repositioning**

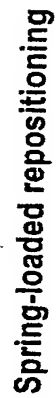
**Fig. 7**

**Ideas of hood releasing concepts**

**- decoupling by using force level, direction and deformation properties-**



## Idea of hood release concepts



**Fig. 9**  
**Improved gasflow for homogeneously lifting of hood**

